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EXAMINER	
WERNER, DAVID N	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/716,265	PUN ET AL.	
	Examiner	Art Unit	
	David N. Werner	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 September 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-5,7-14,16,18-20,22-29,31,32,34,35 and 37-43* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1,3,4,16,18,19,32,35 and 37* is/are allowed.

6)☒ Claim(s) *5,7-14,20,22-29,31,34,38-41 and 43* is/are rejected.

7)☒ Claim(s) *42* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 August 2007* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *20090923*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office action for U.S. Patent Application 10/716,265 is in response to communications filed 5 September 2009, in reply to the Non-Final Rejection of 6 April 2009 and the Interview of 11 August 2009. Currently, Claims 1, 3–5, 7–14, 16, 18–20, 22–29, 31, 32, 34, 35, and 37–43 are pending. Of those, Claim 43 is new.

2. In the previous Office action, the specification was objected to for failing to provide antecedent basis for the claimed subject matter Claims 16, 18–10, 22–29, 31, and 35 were rejected under 35 U.S.C. 101 as non-statutory. Claims 1, 3, 4, 16, 19, 10, 32, 35, and 37 were rejected under 35 U.S.C. 103(a) as obvious over U.S. Patent 6,160,846 A (*Chiang*) in view of "Scalable Rate Control for MPEG-4 Video" (*Lee*). Claims 5, 7–10, 12–14, 20, 22–25, 27–29, 31, 34, 38, 39, and 42 were rejected under 35 U.S.C. 103(a) as obvious over *Chiang* in view of U.S. Patent 5,847,766 A (*Peak*). Claims 11, 26, 40, and 41 were rejected under 35 U.S.C. 103(a) as obvious over *Chiang* in view of *Peak* and in view of U.S. Patent 7,079,581 B2 (*Noh*).

3. In the 11 August 2009 interview, applicant's representatives and the examiner agreed that the rejections of Claims 5 and 7 were improper.

Response to Amendment

4. Applicant's amendments to the claims have been considered. The claim rejections under 35 U.S.C. 101 are withdrawn. Since the specification does not provide any examples of the claimed computer-readable medium, the examiner is interpreting

the claimed medium to be limited to statutory embodiments. See *Ex Parte Azuma*, 2009 WL 2954442 (BPAI 2009).

Response to Arguments

5. Applicant's arguments with respect to the specification have been considered and are persuasive. The objection to the specification is withdrawn.

6. Applicant's arguments, see pages 12–14, filed 5 September 2009, with respect to claim 1 have been fully considered and are persuasive. The rejection of claim 1 has been withdrawn. As mentioned in the previous Office action and discussed in the interview, the *Chiang* reference discloses determining a buffer occupancy accumulator or buffer fullness measure for a current macroblock which includes the difference between the number of bits already encoded for previous macroblocks in a present frame and a scaled bit budget for the present frame. *Office action*, pg. 5. This is different from the claimed buffer occupancy accumulator for a current frame that is the difference between the number of bits used to encode a previous frame of the same type and that previous frame's requested number of bits. The examiner used the *Lee* reference to overcome this discrepancy. The *Lee* reference discloses a "scalable rate control" in a video encoder in which the rate-control technique "offers a general framework for multiple layers of controls for objects, frames, and MBs in various coding contexts". *Lee*, §I. However, upon further review of the *Lee* reference, the scalability of rate control is limited to a rate-distortion model, not to buffer fullness. As applicant

correctly pointed out in pages 13–14 of the arguments, it was improper to use the *Lee* reference to suggest scaling the macroblock-level buffer control in *Chiang* to the frame level.

7. Applicant's arguments, see pages 16–17, filed 5 September 2009, with respect to the rejection(s) of claim(s) 5 under 35 U.S.C. 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of U.S. Patent 6,263,020 B1 (*Gardos*). Equation 3 of *Gardos* clearly shows a bit usage delta calculated as the difference between a "bit usage until now" variable, which is the "total number of bits that have been used to compress the current frame up to the current macroblock", and a "bit usage target" variable, which is "the target value for the number of bits that have already been created for the current compressed frame". *Gardos*, column 4: line 48–column 5: line 1. Equation 4 also clearly shows a local quantization adjustment calculation using the bit usage delta. *Id.* at column 5: line 5.

8. Applicant's arguments, see pages 18–21, filed 5 September 2009, with respect to the rejection(s) of claim(s) 14 under 35 U.S.C. 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of *Gardos*.

9. Applicant's arguments, see pages 22–23, filed 5 September 2009, with respect to the rejection(s) of claim(s) 20 under 35 U.S.C. 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of *Gardos*.

10. Applicant's arguments, see pages 23–24, filed 5 September 2009, with respect to the rejection(s) of claim(s) 29 and 31 under 35 U.S.C. 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of *Gardos*.

Claim Rejections - 35 USC § 112

11. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

12. Claim 39 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

13. Claim 39 recites the limitation "the scaling function" in the second line of the claim. There is insufficient antecedent basis for this limitation in the claim. It appears that Claim 39 is intended to be dependent on claim 9, which provides support for the claimed scaling function, and it will be assumed that this is the case.

Claim Rejections - 35 USC § 102

14. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

15. Claims 5, 13, 20, and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 6,263,020 B1 (*Gardos*). *Gardos* teaches a rate control system in a video encoder. Regarding Claim 1, Equation 6 shows the formula for a quantization parameter for a macroblock. *Gardos*, column 5: lines 10–16. The quantization parameter is based on the mean quantization parameter for the blocks of the previous picture, a global adjustment value for the whole frame based on the difference between the actual number of bits for the previous picture and the target frame size for the current picture, and a local adjustment based on a bit usage delta value. *Id.* Then, the global_adj value which is constant for the whole frame may be considered a "base quantizer", and the local_adj value which varies for each macroblock may be considered a "quantizer adjustment". As shown in equation 4, the local adjustment includes a "bit_usage_delta" factor. The bit_usage_delta variable is defined as the difference between a bit_usage_until_now variable and a bit_usage_target variable. *Id.* at column 4: line 65–column 5: line 3. The bit_usage_until_now variable, in turn is "the total number of bits that have been used to compress the current frame up to the current macroblock". *Id.* This is the claimed "number of bits actually used to encode previous macroblocks of the frame". The bit_usage_target value is the "target value for the number of bits that have already been created for the current compressed frame". *Id.* at 4:46–51. This is the claimed "number of bits that should have been used to encode previous macroblocks of the frame". Then, their difference, or the bit_usage_delta variable in *Gardos*, is the claimed difference, and local_adj, which uses bit_usage_delta, is "based on" this difference, as

claimed. As shown in equation 6, the quantizer parameter formula includes the sum of the global_adj value, mapped with the "base quantizer", and the local_adj value, mapped with the "quantizer adjustment". *Id.* at 5:10–11. Then, newQP in *Gardos* is the claimed quantizer value. This value is actually used in a compression algorithm. *Id.* at 4:12–23. The compression algorithm is performed by a compressor 37, based on the selected quantizer parameter from quantizer selector 36. *Id.* at 2:52–53.

Regarding Claim 13, *Gardos* operates on H.263 video, and so limits the quantization parameter to a value between 0 and 31. *Gardos* at column 5: lines 12–13. Alternatively, the quantization parameter can be further limited to a smaller range, and reset to the mean parameter level for a previous row if the quantization parameter for a current block goes beyond the bounds of the range. *Id.* at column 5: lines 17–61.

Regarding Independent Claim 20, in *Gardos*, the quantization parameter selection described above with respect to Claim 5 is performed by a "processor", as claimed. *Gardos*, column 4: lines 1–11.

Regarding Claim 28, *Gardos* operates on H.263 video, and so limits the quantization parameter to a value between 0 and 31. *Gardos* at column 5: lines 12–13. Alternatively, the quantization parameter can be further limited to a smaller range, and reset to the mean parameter level for a previous row if the quantization parameter for a current block goes beyond the bounds of the range. *Id.* at column 5: lines 17–61.

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

17. Claims 7–10, 12, 14, 22–25, 27, 29, 31, 34, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Gardos* in view of U.S. Patent 6,160,846 A (*Chiang*). Claim 9 is directed to adjusting a quantizer based on a scaling function that is different for different macroblock coding methods. *Gardos* discloses a scaling function that limits the quantization parameter from falling below a certain threshold level. *Chiang*, column 5: line 63–column 6: line 9. However, *Gardos* does not disclose adjusting this scaling function based on different macroblock coding methods.

Chiang teaches a system for encoding a video that selects a quantizing scale to maintain video quality. Regarding Claim 9, *Chiang* maintains three target bit rates for I pictures, P pictures, and B pictures. *Chiang*, column 13: lines 32–51, 56–57. An I frame is limited to blocks with intra coding, but P frames and B frames may contain inter-coded blocks. *Chiang*, column 6: lines 55–57. In equations 12 and 13 of *Gardos*, the floor quantization parameter is based on the global_adj parameter. *Gardos* at column 5: line 3. The global_adj parameter, in turn, is based on the target frame size for the current picture. *Id.* at column 5: lines 7–8). Then, in a combination of *Chiang* and *Gardos*, there will also be three values of global_adj used in scaling, for the three picture types.

Gardos discloses the present invention except for scaling according to macroblock coding methods. *Chiang* shows that the scaling for *Gardos* may be adapted into three models for different pictures with different coding methods available. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to keep three target frame rates available in *Gardos*, as taught by *Chiang* for all purposes, such as scaling, since *Chiang* states in column 8: line 64–column 9: line 7 that such a modification would account for the vastly different complexities, and corresponding bit rates, for different frame types.

Regarding Claim 7, in one embodiment of *Gardos*, the limiting function is dependent on the mean quantization parameter for "the previous row of macroblocks". *Gardos*, column 5: lines 31–45.

Regarding Claim 8, in both embodiments of the scaling factor in *Gardos*, the new QP value is dependent on a mean quantization parameter of previous picture data. A lower quantization parameter corresponds with increased bits per pixel.

Regarding Claim 10, as mentioned above, *Chiang* keeps separate target bit rates available for different picture types that may have different coding methods. *Chiang*, column 6: lines 63–67.

Regarding Claim 12, *Chiang* sets a target picture size for each picture type based on an expected complexity level, or activity measure, as claimed.

Regarding Claim 38, in *Chiang*, "macroblock coding modes…are grouped into two broad classifications, inter mode coding and intra mode coding". *Chiang*, column 6: lines 55–57.

Regarding Claim 43, in the equation 13 embodiment of *Gardos*, the new parameter level is dependent on the global_adj parameter. *Gardos*, column 6: line 3. The global_adj parameter, in turn, is based on N, the number of macroblocks in a picture. *Id.* at column 4: line 31; column 5: line 7.

Regarding Claim 24, as described with respect to claim 9 above, if three target frame sizes, one for each frame type, are used for the scaling in *Gardos*, as taught by *Chiang*, then the scaling of *Gardos* is different for different macroblock coding methods.

Regarding Claim 22, in one embodiment of *Gardos*, the limiting function is dependent on the mean quantization parameter for "the previous row of macroblocks". *Gardos*, column 5: lines 31–45.

Regarding Claim 23, in both embodiments of the scaling factor in *Gardos*, the new QP value is dependent on a mean quantization parameter of previous picture data. A lower quantization parameter corresponds with increased bits per pixel.

Regarding Claim 25, as mentioned above, *Chiang* keeps separate target bit rates available for different picture types that may have different coding methods. *Chiang*, column 6: lines 63–67.

Regarding Claim 27, *Chiang* sets a target picture size for each picture type based on an expected complexity level, or activity measure, as claimed. *Chiang*, column 4: lines 43–50.

Regarding Independent Claim 14, as mentioned above with respect to claim 5, *Gardos* discloses the claimed steps of computing the number of bits that should have been used to encode the previous macroblocks of a frame, determining a delta value, and quantizing a macroblock using the quantizer value from the sum of the base quantizer value and the adjustment based on the delta value. *Chiang* shows that it was known to segregate macroblock encoding according to frame type, as claimed.

Regarding Claim 34, in *Chiang*, "macroblock coding modes…are grouped into two broad classifications, inter mode coding and intra mode coding". *Chiang*, column 6: lines 55–57.

Regarding Claim 41, *Chiang* sets a target picture size for each picture type based on an expected complexity level, or activity measure, as claimed. *Chiang*, column 4: lines 43–50.

Regarding Independent Claim 29, as mentioned above with respect to claims 5 and 20, *Gardos* discloses the claimed steps of computing the number of bits that should have been used to encode the previous macroblocks of a frame, determining a delta value, and quantizing a macroblock using the quantizer value from the sum of the base quantizer value and the adjustment based on the delta value by a processor. *Chiang* shows that it was known to segregate macroblock encoding according to frame type, as claimed.

Regarding Claim 31, in *Chiang*, "macroblock coding modes...are grouped into two broad classifications, inter mode coding and intra mode coding". *Chiang*, column 6: lines 55–57.

18. Claims 11, 26, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Gardos* in view of *Chiang* as applied to claims 5, 14, and 20 above, and further in view of U.S. Patent 7,079,581 B2 (*Noh*). Claims 11, 26, and 40 teach adjusting a quantizer value in a video encoder based on the normalized sum of absolute differences. *Gardos* is silent on motion compensation. Although *Chiang* teaches motion compensation, this is not necessarily factored into calculating a quantization scale.

Noh teaches an apparatus and method for controlling a variable bit rate for a video encoder in real time. Regarding claims 11 and 26, *Noh* discloses a variable bit rate (VBR) controller that determines a quantization factor for a video encoder based on

frame complexity (column 1, lines 45-56). Figure 1 of *Noh* shows encoder 100 with VBR controller 50, which contains Mean Absolute Difference (MAD) calculator 51. The MAD value for a frame is directly used to model complexity of the frame (column 3, lines 48-49). This result is used as an input for target bit rate decision unit 52 and quantization factor decision unit 54 (column 3, lines 61-64).

Gardos, in combination with *Chiang*, discloses the claimed invention except for determining a quantizer scale based on a sum of absolute differences. *Noh* teaches that it was known to determine a quantization factor based on mean absolute difference. Therefore, it would have been obvious for one having ordinary skill at the time the invention was made to set a quantizer according to an absolute difference calculation as taught by Noh et al., since *Noh* states in column 3, lines 31-34 that such a modification would "[minimize] deterioration of the quality of an image while increasing the encoding efficiency" (column 3, lines 31-34).

Allowable Subject Matter

19. Claims 1, 3, 4, 16, 18, 32, 35, and 37 are allowed.

20. The following is a statement of reasons for the indication of allowable subject matter: Claims 1, 3, 4, 16, 18, 32, 35, and 37 are directed to a novel system of setting a buffer occupancy accumulator for a frame as the difference between the actual amount of bits used to encode a previous frame having the same frame type as the current frame and the target frame size or bit budget for the previous frame having the same frame type. The closest prior art is illustrated in a number of patents assigned to C-

Cube Microsystems of Milpitas, California. U.S. Patent 5,878,166 A (*Legall*) is representative. The C-Cube system discloses a two-pass encoder in which a cumulate coding budget deviation is maintained for a frame. *Legall*, column 6: line 61–column 7: line 9. This deviation amount is defined as sum of the previous deviation and the difference between the bit budget for the current frame and the actual number of bits used to encode the frame in the first pass. *Id.* The frame is then re-encoded in the second pass based on a modified bit budget that reduces the accumulated deviation. *Id.* However, the present invention is different from *Legall* in that in the present invention, the accumulator is based on the difference between bit budget and bit size for a previous frame, not the current frame, and one of ordinary skill in the art would not necessarily look to the two-pass system of *Legall* for a solution to rate control based on a previous frame. The global_adj value in *Gardos*, in addition, is based on the difference between the number of bits for the previous frame and the target frame size for the current frame, not the previous frame, as claimed.

21. Claim 42 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

22. Claim 39 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. This amendment would also overcome the rejection under 35 U.S.C. 112, second paragraph.

23. The following is a statement of reasons for the indication of allowable subject matter: Claims 39 and 42 are directed to a quantizer adjustment in which the determined delta value is multiplied by a scaling function different for different coding methods and an activity level for the macroblock. Equation 4 of *Gardos* illustrates the calculation of a local adjustment, in which the delta value is multiplied by a fixed value and the inverse of the target frame size and target frame rate. However, this is not the same as the claimed scaling. *Chiang* discloses that different frame types have different target image sizes. However, if the target image size of *Chiang* is already mapped as a function of complexity or activity level, as indicated by column 4: lines 43–50, *Chiang* does not suggest two separate multiplications of the target frame size for both the claimed scaling function and activity level.

Special Note

24. Allowable independent claims 1 and 16, directed to frame-level quantization adjustment, are considered patentably distinct from independent claims 5, 14, 20, and 29, as presently amended, directed to macroblock-level quantization adjustment. Applicant may want to consider cancelling claims 5, 14, 20, 29, and their dependent claims and re-file as a continuation application claiming priority to the present application, in order to expedite patent protection on the allowed claims.

Conclusion

25. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- U.S. Patent 5,038,209 (*Hang*)
- U.S. Patent 5,677,969 A (*Auyeung*)
- U.S. Patent 6,023,296 A (*Lee*)
- U.S. Patent 6,198,878 B1 (*Blawat*)
- U.S. Patent 6,229,849 B1 (*Mihara*)
- U.S. Patent 6,282,241 B1 (*Saw*)
- U.S. Patent 6,587,506 B1 (*Noridomi*)
- U.S. Patent 6,826,228 B1 (*Hui*)
- U.S. patent 6,847,656 B1 (*Wu*)
- U.S. Patent 6,961,376 B2 (*Wu*)
- U.S. Patent 6,961,378 B1 (*Greenfield*)
- U.S. Patent Application Publication 2002/0012395 A1 (*Song*)
- U.S. Patent Application Publication 2002/0136295 A1 (*Sato*)
- International Publication 02/096120 A1 (*Li*)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571)272-9662. The examiner can normally be reached on Monday-Friday from 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. N. W./
Examiner, Art Unit 2621

/Mehrdad Dastouri/
Supervisory Patent Examiner, Art Unit 2621